

The International Journal of Special Education
2005, Vol 20, No.2.

FUNCTIONAL/STRUCTURAL ANALYSIS: A BRIEF REVIEW OF FUNCTIONAL ASSESSMENT STUDIES CONDUCTED WITH PEOPLE WITH CHALLENGING BEHAVIOURS

Morgan S. Chitiyo

Tennessee Technological University

Since the re-authorization of the Individuals with Disabilities Education Act of 1997 functional assessment has become popular in designing interventions for people with challenging behaviour. The purpose of this study was to assess the applications of functional and structural analysis in the assessment of problem behaviour. The study analysed the extent to which studies either utilized functional or structural analysis methods and whether these studies were conducted in applied or analogue settings. Results of the study showed that 95% of the 101 studies were functional analysis studies while 5% were structural analysis studies. The studies also indicated that 94% of the studies were conducted in analogue settings against 6% conducted in applied settings.

Functional analysis has become very popular as a most potent and effective behavioural assessment methodology (Vollmer and Smith, 1996). Functional analysis is an important component of functional assessment, which involves the direct manipulation of identified variables in order to clarify the hypothesized relationship (Dunlap, Kern, dePerczel, et al., 1993). *The re-authorization of the Individuals with Disabilities Education Act of 1997 (IDEA) introduced functional assessment to federal legislation and directed school personnel to use this research validated procedure* (Zuna & McDougall, 2004, p18). Since Iwata et al.'s landmark study (1982/1994), functional analysis has received a lot of scholarly attention and has been adapted to a variety of settings and populations (Broussard and Northup, 1997).

Procedures developed by Iwata et al., (1982/1994) involved *constructing analogue conditions in controlled environments that simulate the manner in which problem behaviour may be positively or negatively reinforced in natural environments* (Umbreit, 1995, p.18). Functions of behavior are identified by making positive reinforcement (attention or tangibles) or negative reinforcement (escape from task demands) available contingent on the occurrence of problem behaviour (Umbreit, 1995). Although these procedures were initially designed to assess functions of self-injury (Iwata et al, 1982/1994), several studies have successfully replicated these procedures with different populations.

To date, functional analysis has been successfully used to identify functions of self injurious behavior (Mace, Shapiro, & Mace, 1998; Vollmer & Vorndran, 1998; O'Reilly, 1997; Worsdell, Iwata, Hanley, Thompson, & Kahng, 2000; Kahng & Iwata, 1998; Zarcone, Iwata, Smith, Mazaleski, & Lerman 1994; Wacker, Harding, Cooper et al., 1996), pica (Piazza, Fisher, Hanley et al, 1998), stereotypy (Fisher, Lindauer, Alterson, & Thompson, 1998; Kennedy, Meyer, Knowles, & Shukla, 2000), aggression (Thompson, Fisher, Piazza, & Kuhn, 1998; McComas, Hoch, Paone, & El-Roy, 2000; O'Reilly & Carey, 1996), breath holding (Kern, Mauk, Marder, & Mace, 1995), elopement (Piazza, Hanley, Bowman et al., 1997), and out of seat behaviour (Northup, Broussard, Jones et al., 1995). These studies are a testament of the utility of functional analysis across a wide variety of behaviour disorders. This establishment is important because *treatment matched to the operant function of aberrant behaviour generally follows interrelated*

strategies: (a) weakening the maintaining response-reinforcer relationship, and (b) establishing or strengthening a response-reinforcer relationship for an adaptive response class that replaces the function of the aberrant one (Mace, 1994, p.386).

Functional analysis can be applied in both analogue and applied settings (Repp & Horner, 1999). According to Mace (1994) a significant limitation of functional analyses done in analogue settings is *that they may overlook important variables that operate in the client's natural setting, and, hence, the result may not generalize outside the analogue conditions* (external validity) (p.388). Wheeler, Carter, Mayton, & Thomas (1999) questioned the utility of functional analysis within applied settings since much of the research conducted has been in clinical settings. In view of this Mace (1994) suggested combining descriptive and experimental methods to design individualized assessment conditions. This, Mace argues, will incorporate into the design of analogue experimental conditions, naturally occurring consequences for target behaviours and the schedules in which these consequences are arranged thereby increasing the external validity of the experimental analysis. However plausible this sounds, *When no naturalistic observations are available or when descriptive and experimental findings are discordant, conclusions about the operant function of a behaviour problem under natural conditions are best tempered* (Mace, 1994, p.389). Unfortunately, there are very limited, if any, studies done in applied settings.

In assessing variables maintaining problem behaviour, two areas should be considered i.e. functional and structural analysis (Stichter, Sasso, & Jolivette, 2004). Functional analysis refers to the delivery of distinct reinforcers contingent on inappropriate behaviour while structural analysis refers to the presentation of distinct antecedent conditions (Repp and Horner, 1999). *To date, the majority of functional assessment research has focused on identifying and developing interventions that are based on the maintaining consequences of problem behaviour rather than developing interventions that incorporate the potential influence of antecedent events on pro-social and problem behaviors* (Stichter, Sasso, & Jolivette, 2004, p66). However, antecedent events are of critical importance in selection of the design of instructional goals and objectives and instructional methods to be used by the teacher and represent best practice (Wheeler & Wheeler, 1995).

The purpose of the present study was to synthesize recent research (from 1994-2004) published in the Journal of Applied Behavior Analysis on functional and structural analysis. The researcher wanted to investigate whether functional analysis studies conducted to identify functions of problem behaviour and published between 1994 and 2004 were done in applied or analogue settings. Also, the researcher wanted to find out if these studies were conducted using structural or functional analysis procedures. Another purpose of this study was to provide recommendations for future research by showing that although the merits of conducting structural analysis have been identified in prior research (Wheeler & Wheeler, 1997; Wheeler, Carter, Mayton, & Thomas, 2002; Stichter, Sasso, & Jolivette, 2004), researchers have, up to this day, almost exclusively focused on functional analysis in analogue settings.

Method

Criteria for inclusion

Studies selected for inclusion in this review were evaluated based on the following criteria: (a) experimental studies involving functional/structural analysis conducted with people with behaviour problems, (b) articles published in *The Journal of Applied Behavior Analysis* between the years 1994 and 2004.

Procedure

The selected articles were identified through a search of ERIC search engine and *The Journal of Applied Behavior Analysis* (n = 101). The terms used in the search included *functional + analysis + behaviour*, and *structural + analysis + behaviour*.

The selected studies were coded on a matrix using the following variables: (1) title of study (2) year of publication, (3) type of setting (applied or analogue), and (4) type of analysis (functional or structural). The researcher put a check under the appropriate headings, for example, a check under analogue if the research was conducted in analogue conditions as opposed to applied conditions. This same procedure was used to indicate whether the research used functional or structural analysis methods.

Results

One hundred and one studies met the criteria for inclusion in this study. Of these studies, 95% (n=96) were functional analysis studies while the remaining 5% (n=5) were structural analysis studies. Also, 94% (n=95) of the studies were conducted in analogue settings while only 6% (n=6) of the studies were conducted in applied settings. These results are presented in a tabulated form (see figure 1).

Year/Date of Publication	Total No. of studies	Assessment (Analysis)		Setting	
		Structural	Functional	Applied	Analogue
1994	9	1	8	0	9
1995	7	0	7	0	7
1996	11	1	10	0	11
1997	9	0	9	1	8
1998	7	0	7	0	7
1999	3	1	2	0	3
2000	6	0	6	0	6
2001	14	1	13	2	12
2002	15	0	15	0	15
2003	11	1	10	3	8
2004	9	0	9	0	9
Total	101	5	96	6	95
Percentage	100%	5%	95%	6%	94%

Figure 1
Table of studies

Discussion

It is interesting to note that only 5 of the 101 studies (5%) used structural analyses. Considering the perceived efficacy of antecedent management in reducing problem behaviour, one would expect that researchers would seek to manipulate the antecedent events that trigger problem behaviour as much as they manipulate the consequences. Manipulating antecedent events has the potential of establishing a basis on which to design instructional goals and objectives and instructional methods. On the contrary, consequence management tends to be a reactive strategy, which although sometimes helpful, focuses on temporary suppression of behaviours without teaching alternative responses.

Another significant discovery is that of the 101 studies in this study, only 6% (n=6) were conducted in applied settings while 95 (94%) were done in analogue settings. This raises questions on the generalizability of those findings of analogue studies to natural settings. Analogue settings can produce good results but transferring those results to natural settings can be difficult since a number of idiosyncratic variables available in the natural settings might not be present in the analogue settings thereby interfering with the authenticity of the findings. It is difficult to determine whether studies in this investigation were transferable because the main target for most studies was to determine the function(s) of the target behavior(s) and follow up data on results of the interventions is not present.

A major limitation of this study is that studies published in only one journal were included (*The Journal of Applied Behavior Analysis*). Apparently, there are several studies done in the same area published in other journals. Including those studies would have provided a more thorough

view on the subject. Another significant limitation of the study is that it did not consider the outcomes of the studies. Perhaps, doing so would have enabled us to make an informed comparison of the impact of functional analysis and structural analysis, as well as studies conducted in applied and analogue settings on problem behaviour. However, the major purpose of this study was to show the discrepancy between the perceived efficacies of antecedent management, and of doing studies in applied settings and the paucity of attention given to these areas in recent research.

Future research should investigate the efficacy of structural analysis in identifying antecedent events that occasion problem behaviour such as self-injury and aggression. Future researchers should also consider conducting functional/structural analysis in applied settings to promote the linkage between assessment and treatment. Such a focus, it is hoped, will augment the external validity of any findings thereby maximizing the utility of the functional/structural analysis process.

References

- Anderson, C.M., & Long, E.S. (2002). Use of a structured descriptive assessment methodology to identify variables affecting problem behavior. *Journal of Applied Behavior Analysis* **35**, *2*, 37-54
- Asmus, J.M., Ringdahl, J.E., Sellers, J.A., Call, N.A., Andelman, M.S., & Wacker, D.P. (2004). Use of a short-term inpatient model to evaluate aberrant behaviour: Outcome data summaries from 1996 to 2000. *Journal of Applied Behavior Analysis* **37**, *3*, 283-304
- Broussard, C., & Northup, J. (1997). The use of functional analysis to develop peer interventions for disruptive classroom behaviour. *School Psychology Quarterly*, **12**, *1*, 65-76
- Borrero, J.C., & Vollmer, T. (2002). An application of the matching law to severe problem behavior. *Journal of Applied Behavior Analysis* **35**, *1*, 3-27
- Borrero, J.C., Vollmer, T.R., & Wright, C.S. (2002). An evaluation of contingency strength and response suppression. *Journal of Applied Behavior Analysis*, **35**, *3*, 337-47
- Carr, E.G. (1994). Emerging themes in the functional analysis of problem behaviour. *Journal of Applied Behavior Analysis* **27**, *2*, 393-399
- Borrero, J.C., Vollmer, T.R., Wright, C.S., Lerman, D.C., & Kelley, M.E. (2002). Further evaluation of the role of protective equipment in functional analysis of self-injurious behavior. *Journal of Applied Behavior Analysis*, **35**, *1*, 69-72
- Day, M.H., Horner, R.H., & O'Neill, R.E. (1994). Multiple functions of problem behaviors: Assessment and intervention. *Journal of Applied Behavior Analysis*, **27**, *2*, 279-289
- Deaver, C.M., Miltenberger, R.G., & Stricker, J.M. (2001). Functional analysis and treatment of hair twirling in a young child. *Journal of Applied Behavior Analysis*, **34**, *4*, 535-538
- DeLeon, I.G., Arnold, K.L., Rodriguez-Carter, V., & Uy, M.C. (2003). Covariation between bizarre and non-bizarre speech as a function of the content verbal attention. *Journal of Applied Behavior Analysis* **36**, *1*, 101-104
- Derby, M.K., Wacker, D.P., Peck, S., Sasso, G., DeRaad, A., Berg, W., Asmus, J., & Ulrich, S. (1994). Functional analysis of separate topographies of aberrant behavior. *Journal of Applied Behavior Analysis* **27**, *2*, 267-278
- Dixon, M.R., Benedict, H., & Larson, T. (2001) Functional analysis and treatment of inappropriate verbal behavior. *Journal of Applied Behavior Analysis* **34**, *3*, 361-63
- Dunlap, G., Kern, L., dePerczel, M., Clarke, S., Wilson, D., Childs, K.E., White, R., & Falk, G.D. (1993). Functional analysis of classroom variables for students with emotional and behavioral disorders. *Behavioral Disorders* **18**, *4*, 275-291
- Ebanks, M.E., & Fisher, W.W. (2003). Altering the timing of academic prompts to treat destructive behavior maintained by escape. *Journal of Applied Behavior Analysis* **36**, *3*, 355-59
- Falcomata, T.S., Roane, H.S., Hovanetz, A.N., Kettering, T.L., & Keene, K.M. (2004). An evaluation of response cost in treatment of inappropriate vocalizations maintained by automatic reinforcement. *Journal of Applied Behavior Analysis* **37**, *1*, 83-87
- Fisher, W.W., DeLeon, I.G., Rodriguez-Catter, V., & Keeney, K.M. (2004). Enhancing the effects of extinction on attention-maintained behavior through non-contingent delivery of

attention or stimuli identified via a competing stimulus assessment. *Journal of Applied Behavior Analysis* **37, 2**, 171-184

Fisher, W.W., Lindauer, S.E., Alterson, C.J., & Thompson, R.H. (1998). Assessment and treatment of destructive behavior maintained by stereotypic object manipulation. *Journal of Applied Behavior Analysis* **31, 4**, 513-527

Fisher, W.W., Piazza, C.C., & Chiang, L.C. (1996). Effects of equal and unequal reinforcer duration during functional analysis. *Journal of Applied Behavior Analysis* **29, 1**, 117-120

Flood, W.A., Wilder, D.A., Flood, A.L., & Masuda, A. (2002). Peer mediated reinforcement plus prompting as treatment for off-task behaviour in children with attention deficit hyperactivity disorder. *Journal of Applied Behavior Analysis* **35, 2**, 199-204

Frea, W.D., & Hughes, C. (1997). Functional analysis and treatment of social-communicative behavior of adolescents with developmental disabilities. *Journal of Applied Behavior Analysis* **30, 4**, 701-704

Fyffe, C.E., Kahng, S., Fittro, E., & Russell, D. (2004). Functional analysis and treatment of inappropriate sexual behavior. *Journal of Applied Behavior Analysis* **37, 3**, 401-404

Goh, L., Iwata, B.A., Shore, B.A., DeLeon, I.G., Lerman, D.C., Ulrich, S.M., & Smith, R.G. (1995). An analysis of the reinforcing properties of hand mouthing. *Journal of Applied Behavior Analysis* **28, 3**, 269-83

Hagopian, L.P., Fisher, W.W., & Legacy, S.M. (1994). Schedule effects of noncontingent reinforcement on attention-maintained destructive behavior in identical quadruplets. *Journal of Applied Behavior Analysis* **27, 2**, 317-25

Hagopian, L.P., Wilson, D.M., & Wilder, D.A. (2001). Assessment and treatment of problem behavior maintained by escape from attention and access to tangible items. *Journal of Applied Behavior Analysis* **34, 2**, 229-232

Hanley, G.P., Iwata, B.A., & Thompson, R.A. (2001). Reinforcement schedule thinning following treatment with functional communication training. *Journal of Applied Behavior Analysis* **34, 1**, 17-38

Harding, J.W., Wacker, D.P., Berg, W.K., Barrero, A., Winborn, L., & Gardner, A. (2001). Analysis of response class hierarchies with attention maintained problem behaviours. *Journal of Applied Behavior Analysis* **34, 1**, 61-64

Horner, R.H., Day, H.M., & Day, J.R. (1997). Using neutralizing routines to reduce problem behaviours. *Journal of Applied behavior Analysis* **30, 4**, 601-614

Iwata, B.A. (1994). Functional analysis methodology: some closing comments. *Journal of Applied Behavior Analysis* **27, 2**, 413-418

Iwata, B.A., Dorsey, M.F., Slifer, K.J., Bauman, K.E., & Richman, G.S. (1994). Toward a functional analysis of self-injury. *Journal of Applied Behavior Analysis* **27, 2**, 197-209

Jones, K.M., Drew, H.A., & Weber, N.L. (2000). Noncontingent peer attention as treatment for disruptive classroom behaviour. *Journal of Applied Behavior Analysis* **33, 3**, 343-346

Kahng, S., Abt, K.A., & Schonbachler, H.E. (2001). Assessment and treatment of low-rate high-intensity problem behaviour. *Journal of Applied Behavior Analysis* **34, 2**, 225-228

Kahng, S., & Iwata, B.A. (1998). Play versus alone conditions as controls during functional analysis of self-injurious escape behaviour. *Journal of Applied Behavior Analysis* **31, 4**, 669-672

Kelley, M.E., Lerman, D.C., & VanCamp, C.M. (2002). The effects of competing reinforcement schedules on the acquisition of functional communication. *Journal of Applied behavior Analysis* **35, 1**, 69-72

Kennedy, C.H., Meyer, K.A. (1996). Sleep deprivation allergy symptoms, and negatively reinforced problem behaviour. *Journal of Applied Behavior Analysis* **29, 1**, 133-135

Kennedy, C.H., Meyer, K.A., Knowles, T., & Shukla, S. (2000). Analyzing the multiple functions of stereotypic behavior for students with autism: Implications for assessment and treatment. *Journal of Applied Behavior Analysis* **33, 4**, 559-571

Kennedy, C.H., & Souza, G. (1995). Functional analysis and treatment of eye poking. *Journal of Applied Behavior Analysis* **28, 1**, 27-37

Kern, L., Mauk, J.E., Marder, T.J., Mace C.F. (1995). Functional analysis and intervention for breath holding. *Journal of Applied Behavior Analysis* **28, 3**, 339-40

- Kodak, T., Grow, L., & Northup, J. (2004). Functional analysis and treatment of of elopement for a child with attention deficit hyperactivity disorder. *Journal of Applied Behavior Analysis* **37**, 2, 229-232
- Kurtz, P.F., Chin, M.D., Huete, J.M., Tarbox, R.S.F., O'Connor, J.T., Paclawskyj, T.B., & Rush, K.S. (2003). Functional analysis and treatment of self-injurious behavior in young children: A summary of 30 cases. *Journal of Applied Behavior Analysis* **36**, 2, 205-19
- Lalli, J.S., Casey, S., & Kates, K. (1995). Reducing escape behavior and increasing task completion with functional communication training, extinction, and response chaining. *Journal of Applied Behavior Analysis* **28**, 3, 261-68
- Lalli, J.S., Livezey, K., & Kates, K. (1996). Functional analysis and treatment of eye poking with response blocking. *Journal of Applied Behavior Analysis* **29**, 1, 129-132
- Lancaster, B.M., LeBlanc, L.A., Carr, J.E., Brenske, S., Peet, M.M., & Culver, J.J. (2004). Functional analysis and treatment of the bizarre speech of dually diagnosed adults. *Journal of Applied Behavior Analysis* **37**, 3, 395-399
- Lerman, D.C., Iwata, B.A., Smith, R.G., Zarcone, J.R., & Vollmer, T.R. (1994). Transfer of behavioral function as a contributing factor in treatment relapse. *Journal of Applied Behavior Analysis* **27**, 2, 357-370
- Lerman, D.C., Kelley, M.E., Vorndran, C.M., Kuhn, S.A.C., & Larve Jr., R.H. (2002). Reinforcement magnitude and responding during treatment with differential reinforcement. *Journal of Applied Behavior Analysis* **35**, 1, 29-48
- Lindauer, S.E., Zarcone, J.R., Richman, D.M., & Schroeder, S.R. (2002). A comparison of multiple reinforcer assessments to identify the function of maladaptive behavior. *Journal of Applied Behavior Analysis* **35**, 3, 299-303
- Lindberg, J.S., Iwata, B.A., Roscoe, E.M., Worsdell, A.S., & Hanley, G.P. (2003). Treatment efficacy of non-contingent reinforcement during brief and extended application. *Journal of Applied Behavior Analysis* **36**, 1, 1-19
- Mace, A.B., Shapiro, E.S., & Mace, F.C. (1998). Effects of warning stimuli for reinforcer withdrawal and task onset on self-injury. *Journal of Applied Behavior Analysis* **31**, 4, 679-682
- Mace, F.C. (1994). The significance and future of functional analysis methodologies. *Journal of Applied Behavior Analysis* **27**, 2, 385-392
- Magee, S.K., & Ellis, J. (2000). Extinction effects during the assessment of multiple problem behaviors. *Journal of Applied Behavior Analysis* **33**, 3, 313-316
- Magee, S.K., & Ellis, J. (2001). The detrimental effects of physical restraint as a consequence for inappropriate classroom behavior. *Journal of Applied Behavior Analysis* **34**, 4, 501-04
- Mazaleski, J.L., Iwata, B.A., Rodgers, T.A., Vollmer, T.R., & Zarcone, J.R. (1994). Protective equipment as treatment for stereotypic hand mouthing: Sensory extinction or punishment effects. *Journal of Applied Behavior Analysis* **27**, 2, 345-355
- McCord, B.E., Thompson, R.J., & Iwata, B. A. (2001). Functional analysis and treatment of self-injury associated with transitions. *Journal of Applied Behavior Analysis* **34**, 2, 195-210
- McCord, B.E., Iwata, B.E., Galenski, T.L., Ellington, S.A., & Thomson, R.J. (2001). Functional analysis and treatment of problem behavior evoked by noise. *Journal of Applied Behavior Analysis* **34**, 4, 447-462
- McComas, J., Hoch, H., Paone, D., & El-Roy, D. (2000). Escape behavior during academic tasks: A preliminary analysis of idiosyncratic establishing operations. *Journal of Applied Behavior Analysis* **33**, 4, 479-493
- Moore, J.W., & Edwards, R.P. (2003). An analysis of aversive stimuli in classroom demand contexts. *Journal of Applied Behavior Analysis* **36**, 3, 339-348
- Moore, J.W., Fisher, W.W., & Pennington, A. (2004). Systematic application and removal of protective equipment in the assessment of multiple topographies of self-injury. *Journal of Applied Behavior Analysis* **37**, 1, 73-77
- Moore, J.W., Mueller, M.M., Dubard, M., Roberts, D.S., & Sterling-Turner, H.E. (2002). The influence of therapist attention on self-injury during a tangible condition. *Journal of Applied behavior Analysis* **35**, 3, 283-86

- Mueller, M.M., Edwards, R.P., & Trahan, D. (2003). Translating multiple techniques into an intervention selection model for classrooms. *Journal of Applied Behavior Analysis* **36**, *4*, 563-73
- Mueller, M.M., Wilczynski, S.M., Moore, J.W., Fusilier, I., & Trahan, D. (2001). Antecedent manipulations in a tangible condition: effects of stimulus preference on aggression. *Journal of Applied Behavior Analysis* **34**, *2*, 237-40
- Najdowski, A.C., Wallace, M.C., Doney, J.K., & Ghezzi, P.M. (2003). Parental assessment and treatment of food selectivity in natural settings. *Journal of Applied Behavior Analysis* **36**, *3*, 383-86
- Northup, J., Broussard, C., Jones, K., George, T., Vollmer, T.R., & Herring, M. (1995). The differential effects of teacher and peer attention on the disruptive classroom behaviour of three children with diagnosis of attention deficit hyperactivity disorder. *Journal of Applied Behavior Analysis* **28**, *2*, 227-28
- Northup, J., Kodak, T., Lee, J., & Coyne, M. (2004). Instructional influences on analogue functional analysis outcomes. *Journal of Applied Behavior Analysis* **37**, *4*, 509-512
- O'Reilly, M.F. (1997). Functional analysis of episodic self-injury correlated with recurrent otitis media. *Journal of Applied Behavior Analysis* **29**, *1*, 165-167
- O'Reilly, M.F., & Carey, Y. (1996). A preliminary analysis of the effects of prior classroom conditions on performance under analogue analysis conditions. *Journal of Applied Behavior Analysis* **29**, *4*, 581-584
- O'Reilly, M.F., Lacey, C., & Lancioni, G.E. (2000). Assessment of the influence of background noise on escape maintained problem behavior and pain behaviour in a child with Williams Syndrome. *Journal of Applied Behavior Analysis* **33**, *4*, 511-514
- Peck, S.M., Wacker, D.P., Berg, W.P., Cooper, L.J., Brown, K.A., Richman, D., McComas, J.J., Frischmeyer, P., & Millard, T. (1996). Choice-making treatment of young children's severe behavior problems. *Journal of Applied Behavior Analysis* **29**, *3*, 263-290
- Perry, A.C., & Fisher, W.W. (2001). Behavioural economic influences on treatments designed to decrease destructive behavior. *Journal of Applied Behavior Analysis* **34**, *n2*, 211-215
- Piazza, C.C., Bowman, L.G., Contrucci, S.A., Delia, M.D., Adelinis, J.D., & Goh, H. (1999). An evaluation of the properties of attention as reinforcement for destructive and appropriate behavior. *Journal of Applied Behavior Analysis* **32**, *4*, 437-449
- Piazza, C.C., Hanley, G.P., Bowman, L.G., Ruyter, J.M., Lindauer, S.E., & Saiontz, D.M. (1997). Functional analysis and treatment of elopement. *Journal of Applied Behavior Analysis* **30**, *4*, 653-672
- Piazza, C.C., Fisher, W.W., Brown, K.A., Shore, B.A., Patel, M.R., Katz, R.M., Sevin, B.M., & Gulotta, C.S. (2003). Functional analysis of inappropriate mealtime behaviours. *Journal of Applied Behavior Analysis* **36**, *2*, 187-204
- Piazza, C.C., Fisher, W.W., Hanley, G.P., Hilker, K., & Derby, M. (1996). A preliminary procedure for predicting the positive and negative effects of reinforcement-based procedures. *Journal of Applied Behavior Analysis* **29**, *2*, 137-152
- Piazza, C.C., Fisher, W.W., Hanley, G.P., LeBlanc, L.A., Worsdell, A.S., Lindauer, S.E., & Keeney, K.M. (1998). Treatment of pica through multiple analysis of its reinforcing functions. *Journal of Applied Behavior Analysis* **31**, *2*, 165-189
- Piazza, C.C., Moes, D.R., & Fisher, W.W. (1996). Differential reinforcement of alternative behavior and demand fading in the treatment of escape-maintained destructive behavior. *Journal of Applied Behavior Analysis* **29**, *4*, 569-572
- Piazza, C.C., Roane, H.S., Keeney, K.M., Boney, B.R., & Abt, K.A. (2002). Varying response effort in the treatment of pica maintained by automatic reinforcement. *Journal of Applied Behavior Analysis* **35**, *3*, 233-46
- Repp, A. (1999). Comments on functional analysis procedures for school-based behavior problems. *Journal of Applied Behavior Analysis* **27**, *2*, 409-411
- Repp, A. C., & Horner, R.H. (1999). *Functional analysis of problem behavior: From effective assessment to effective support*. Toronto, Canada: Wadsworth Publishing Company

- Rettfeldt, R.A., & Chambers, M.R. (2003). Functional analysis and treatment of verbal perseverations displayed by an adult with autism. *Journal of Applied Behavior Analysis* **36**, 2, 259-261
- Richman, D.M., Lindauer, S.E., Crosland, K.A., McKerchar, T.L., & Morse, P.S. (2001). Functional Analysis and treatment of breath-holding maintained by nonsocial reinforcement. *Journal of Applied Behavior Analysis* **34**, 4, 531-534
- Richman, D.M., Wacker, D.P., & Winborn, L. (2001). Response efficiency during functional communication training: effects of effort on response allocation. *Journal of applied Behavior Analysis* **34**, 1, 73-76
- Ringdahl, J.E., Winborn, L.C., Andelman, M.S., & Kitsukawa, K. (2002). The effects of noncontingently available alternative stimuli on functional analysis outcomes. *Journal of Applied Behavior Analysis* **35**, 4, 407-10
- Romaniuk, C., Miltenberger, R., Conyers, C., Jenner, N., Jurgens, M., & Ringenberg, C. (2002). The influence of activity choice on problem behaviors maintained by escape versus attention. *Journal of Applied Behavior Analysis* **35**, 4, 349-62
- Shirley, M.J., Iwata, B.A., Kahgn, S., Mazaleski, J.L., & Lerman, D.C. (1997). Does functional communication training compete with ongoing contingencies of reinforcement? An analysis during response acquisition and maintenance. *Journal of Applied Behavior Analysis* **30**, 1, 93-104
- Shukla, S., & Albin, R.W. (1996). Effects of extinction alone and extinction plus functional communication training on covariation of problem behavior. *Journal of Applied Behavior Analysis* **29**, 4, 565-568
- Smith, R.G., & Churchill, R.M. (2002). Identification of environmental determinants of behavior disorders through functional analysis of precursor behaviors. *Journal of Applied Behavior Analysis* **35**, 2, 125-36
- Smith, R.G., Iwata, B.A., Goh, H., & Shore, B.A. (1995). Analysis of establishing operations for self-injury maintained by escape. *Journal of Applied Behavior Analysis* **28**, 4, 515-35
- Stitcher, J.P., Sasso, G.M., & Jolivet, K. (2004). Structural analysis and intervention in a school setting: Effects on problem behavior for a student with an emotional/behavioral disorder. *Journal of Positive Behavior Interventions* **6**, 3, 166-177
- Tang, J., Kennedy, C.H., Koppekin, A., Caruso, M. (2002). Functional analysis of stereotypical ear covering in a child with autism. *Journal of Applied Behavior Analysis* **35**, 1, 95-98
- Tarbox, R.S.F., Wallace, M.C., & Williams, L. (2003). Assessment and treatment of elopement: A replication and extension. *Journal of Applied Behavior Analysis* **36**, 2, 259-61
- Taylor, I., & O'Reilly, M.F. (1997). Toward a functional analysis of private verbal self-regulation. *Journal of Applied Behavior Analysis* **30**, 1, 43-58
- Thompson, R.H., Fisher, W.W., Piazza, C.C., & Kuhn, D.E. (1998). The evaluation and treatment of aggression maintained by attention and automatic reinforcement. *Journal of Applied Behavior Analysis* **31**, 1, 103-116
- Umbreit, J. (1995). Functional analysis of disruptive behaviour in an inclusive classroom. *Journal of Early Intervention* **20**, 1, 18-29
- Valdovinos, M.G., Roberts, C., & Kennedy, C.H. (2004). Analogue functional analysis of movements associated with tardive dyskinesia. *Journal of Applied Behavior Analysis* **37**, 3, 391-393
- Vollmer, T.R., Borrero, J.C., Lalli, J.S., & Daniel, D. (1999). Evaluating self-control and impulsivity in children with severe behaviour disorders. *Journal of Applied Behavior Analysis* **32**, 4, 451-466
- Vollmer, T.R., Marcus, B.A., & LeBlanc, L. (1994). Treatment of self-injury and handmouthing following inconclusive functional analysis. *Journal of Applied Behavior Analysis* **27**, 2, 331-344
- Vollmer, T.R., Marcus, B.A., Ringdahl, J.E., & Roane, H.S. (1995). Progressing from brief assessments to extended experimental analysis in the evaluation of aberrant behaviour. *Journal of Applied Behavior Analysis* **28**, 4, 561-576
- Vollmer, T.R., & Smith, R.G. (1996). Some current themes in functional analysis research. *Research in Developmental Disabilities* **17**, 3, 229-249

- Vollmer, T.R., & Vorndran, C.M. (1998). Assessment of self-injurious behaviour maintained by access to self-restraint materials. *Journal of Applied Behavior Analysis* **31**, *4*, 647-650
- Wacker, D.P., Berg, W.K., Cooper, L.J., Derby, K.M., Steege, W.M., Northup, J., & Sasso, G. (1994). The impact of functional analysis methodology on outpatient clinic services. *Journal of Applied Behavior Analysis* **27**, *2*, 405-407
- Wacker, D.P., Harding, J., Cooper, L.J., Derby, K.M., Peck, S., Asmus, J., Berg, W.K., & Kimberly, A.B. (1996). The effects of meal schedule and quantity on problematic behavior. *Journal of Applied Behavior Analysis* **29**, *1*, 79-87
- Wallace, M.D., & Knights, D.J. (2003). An evaluation of a brief functional analysis format within a vocational setting. *Journal of Applied Behavior Analysis* **36**, *1*, 125-128
- Wheeler, J.J., Carter, S.L., Mayton, M.R., & Thomas, R.A. (2002). Structural analysis of instructional variables and their effects on task-engagement and self-aggression. *Education and Training in Mental Retardation and Developmental Disabilities* **37**, *4*, 391-39
- Wheeler, J.J., & Wheeler, W.R. (1995). Reducing challenging behaviour through the modification of instructional antecedents: A case study. *B.C. Journal of Special Education* **19**, *2/3*, 4-14
- Wilder, D.D., Masuda, A., O'Connor, C., & Baham, M. (2001). Brief functional analysis and treatment of bizarre vocalizations in an adult with schizophrenia. *Journal of Applied Behavior Analysis* **34**, *1*, 65-68
- Winborn, L., Wacker, D.P., Richman, D.M., Asmus, J., & Geier, D. (2002). Assessment of mand selection for functional communication training packages. *Journal of Applied Behavior Analysis* **35**, *3*, 295-98
- Worsdell, A.S., Iwata, B.A., Hanley, G.P., Thompson, R.H., & Kahng, S. (2000). Effects of continuous and intermittent reinforcement for problem behavior during functional communication training. *Journal of Applied Behavior Analysis* **33**, *2*, 167-179
- Zarcone, J.R., Iwata, B.A., Smith, R.G., Mazaleski, J.L., & Lerman, D.C. (1994). Reemergence and extinction of self-injurious escape behaviour during stimulus (instructional) fading. *Journal of Applied Behavior Analysis* **27**, *2*, 307-16
- Zuna, N., & McDougall, D. (2004). Using positive behavioural support to manage avoidance of academic tasks. *Teaching Exceptional Children* **37**, *1*, 18-24